РК2 Крайчиков Олег Денисович

Импорт библиотек

In [29]:

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from pandas.plotting import scatter_matrix
import warnings
warnings.filterwarnings('ignore')
sns.set(style="ticks")
%matplotlib inline
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
```

In [30]:

```
data = pd.read_csv('kar.csv')
```

In [88]:

```
data.head()
```

Out[88]:

	ID	Name	Age	Nationality	Overall	Potential	Club
0	158023	L. Messi	31	Argentina	94	94	6
1	20801	Cristiano Ronaldo	33	Portugal	94	94	123
2	190871	Neymar Jr	26	Brazil	92	93	20
3	193080	De Gea	27	Spain	91	93	139
4	192985	K. De Bruyne	27	Belgium	91	92	13

In [32]:

```
parts = np.split(data, [10], axis=1)
data = parts[0]
```

In [63]:

```
data.dtypes
```

Out[63]:

```
ID              Int64
Name           string
Age             Int64
Nationality    string
Overall         Int64
Potential       Int64
Club           string
dtype: object
```

In [61]:

```
data = data.convert_dtypes()
```

In [77]:

```
data.isnull().sum()
```

Out[77]:

```
ID             0
Name           0
Age            0
Nationality    0
Overall        0
Potential      0
Club           0
dtype: int64
```

In [64]:

```
data.dtypes
```

Out[64]:

```
ID               Int64
Name            string
Age              Int64
Nationality     string
Overall          Int64
Potential        Int64
Club            string
dtype: object
```

In [95]:

```
le = LabelEncoder()
le.fit(data.Name)
data.Name = le.transform(data.Name)
```

In [96]:

```
data.head()
```

Out[96]:

	ID	Name	Age	Nationality	Overall	Potential	Club
0	158023	9632	31	9632	94	94	6
1	20801	3153	33	3153	94	94	123
2	190871	12508	26	12508	92	93	20
3	193080	4136	27	4136	91	93	139
4	192985	8617	27	8617	91	92	13

In [75]:

```
data.isnull().sum()
# проверим есть ли пропущенные значения
```

Out[75]:

```
ID             0
Name           0
Age            0
Nationality    0
Overall        0
Potential      0
Club           0
dtype: int64
```

In [97]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 18207 entries, 0 to 18206
Data columns (total 7 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   ID           18207 non-null  Int64
 1   Name         18207 non-null  int32
 2   Age          18207 non-null  Int64
 3   Nationality  18207 non-null  int32
 4   Overall      18207 non-null  Int64
 5   Potential    18207 non-null  Int64
 6   Club         18207 non-null  int32
dtypes: Int64(4), int32(3)
memory usage: 853.6 KB
```

In [98]:

```
data.head()
```

Out[98]:

	ID	Name	Age	Nationality	Overall	Potential	Club
0	158023	9632	31	9632	94	94	6
1	20801	3153	33	3153	94	94	123
2	190871	12508	26	12508	92	93	20

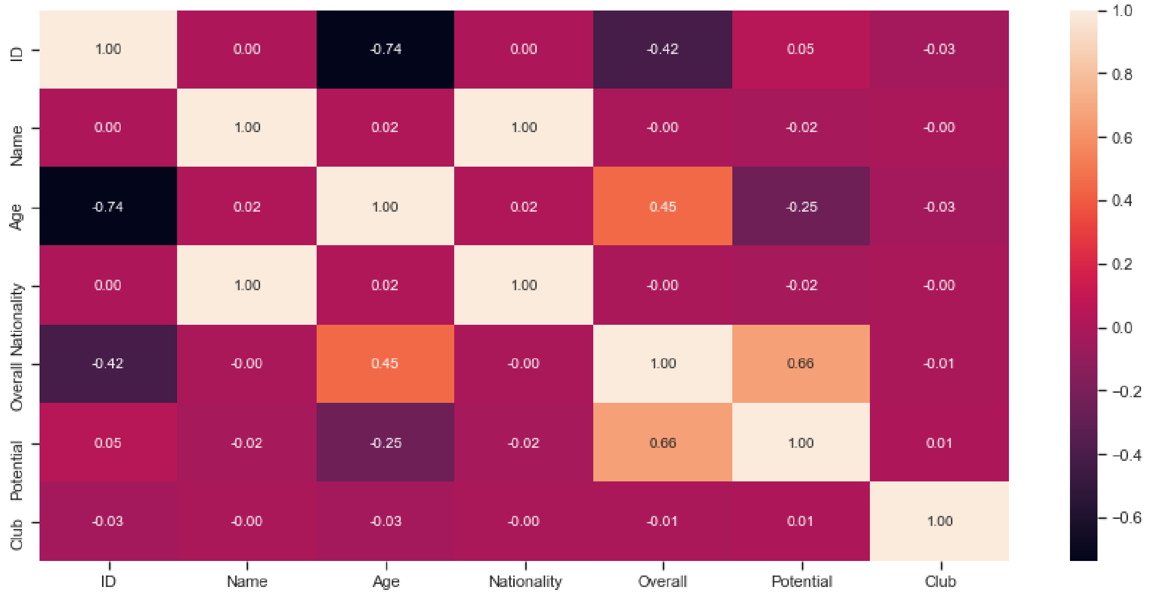
3	193080	4136	27	4136	91	93	139
4	192985	8617	27	8617	91	92	13

In [99]:

```
#Построим корреляционную матрицу
fig, ax = plt.subplots(figsize=(15,7))
sns.heatmap(data.corr(method='pearson'), ax=ax, annot=True, fmt='.2f')
```

Out[99]:

```
<AxesSubplot:>
```



In [124…

```
X = data.drop(['Overall'], axis = 1)
Y = data.Overall
print('Входные данные:\n\n', X.head(), '\n\nВыходные данные:\n\n', Y.hea
```

```
Входные данные:

        ID   Name  Age  Nationality  Potential  Club
0  158023   9632   31         9632         94     6
1   20801   3153   33         3153         94   123
2  190871  12508   26        12508         93    20
3  193080   4136   27         4136         93   139
4  192985   8617   27         8617         92    13

Выходные данные:

 0    94
1    94
2    92
3    91
4    91
Name: Overall, dtype: Int64
```

In [125…

```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, random_sta
print('Входные параметры обучающей выборки:\n\n',X_train.head(), \
      '\n\nВходные параметры тестовой выборки:\n\n', X_test.head(), \
      '\n\nВыходные параметры обучающей выборки:\n\n', Y_train.head(), \
      '\n\nВыходные параметры тестовой выборки:\n\n', Y_test.head())
```

```
Входные параметры обучающей выборки:

           ID  Name  Age  Nationality  Potential  Club
17929  244056  2990   18         2990         66   115
10668  231353  4441   20         4441         77    59
15882  229914  4556   21         4556         62   126
14698  245522  6093   24         6093         62   130
```

```
8509   237252  7745   23         7745        73   157

Входные параметры тестовой выборки:

            ID   Name  Age  Nationality  Potential  Club
15885  228381   4404   22         4404         65   144
13652  223146   5267   22         5267         69   145
13522  208771   5540   24         5540         65   126
7814   228388  11612   23        11612         76   132
15904  243243  15269   19        15269         72   153

Выходные параметры обучающей выборки:

 17929    51
10668    65
15882    58
14698    60
8509     67
Name: Overall, dtype: Int64

Выходные параметры тестовой выборки:

 15885    58
13652    62
13522    62
7814     67
15904    58
Name: Overall, dtype: Int64
```

In [126…

```
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_error, mean_squared_error,  me
```

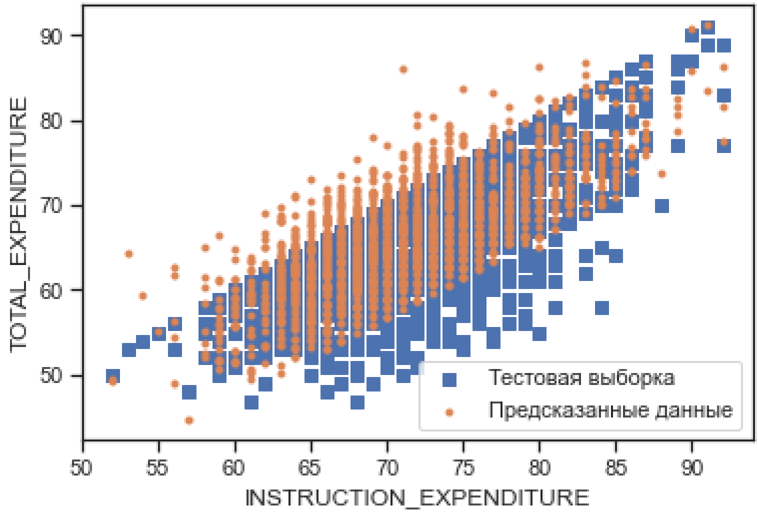
In [127…

```
Lin_Reg = LinearRegression().fit(X_train, Y_train)

lr_y_pred = Lin_Reg.predict(X_test)
```

In [128…

```
plt.scatter(X_test.Potential, Y_test,    marker = 's', label = 'Тестовая
plt.scatter(X_test.Potential, lr_y_pred, marker = '.', label = 'Предсказ
plt.legend (loc = 'lower right')
plt.xlabel ('INSTRUCTION_EXPENDITURE')
plt.ylabel ('TOTAL_EXPENDITURE')
plt.show()
```



In [136…

```
print('Коэффициент детерминации:',    r2_score(Y_test, lr_y_pred))
print('Средняя абсолютная ошибка:',   mean_absolute_error(Y_test, lr_y_p
print('Средняя квадратичная ошибка:', mean_squared_error(Y_test, lr_y_pr
print('Median absolute error:',       median_absolute_error(Y_test, lr_y
Коэффициент детерминации: 0.8467083078866217
Средняя абсолютная ошибка: 2.0961041462500787
Средняя квадратичная ошибка: 7.275976479869679
Median absolute error: 1.7898126738096636
```

In [129…

```
from sklearn.ensemble import RandomForestRegressor
```

In [130…

```
forest_1 = RandomForestRegressor(n_estimators=5, oob_score=True, random_
forest_1.fit(X, Y)
```

Out[130…

```
RandomForestRegressor(n_estimators=5, oob_score=True, random_state=10)
```

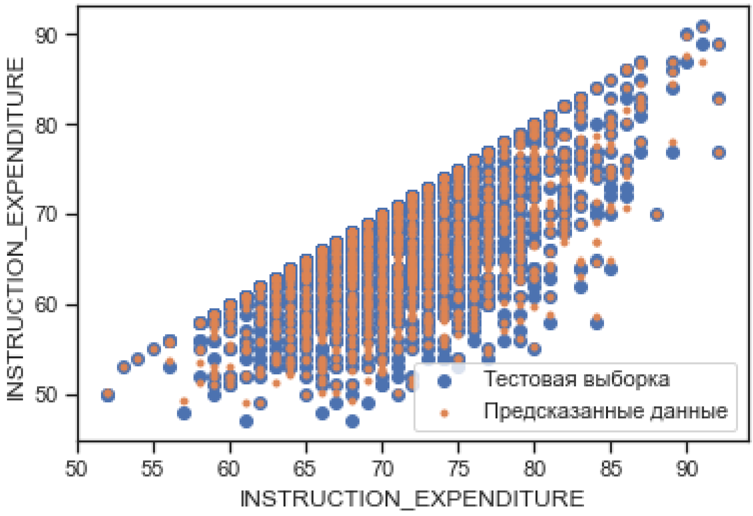
In [131…

```
Y_predict = forest_1.predict(X_test)
print('Средняя абсолютная ошибка:',   mean_absolute_error(Y_test, Y_pred
print('Средняя квадратичная ошибка:', mean_squared_error(Y_test, Y_predi
print('Median absolute error:',       median_absolute_error(Y_test, Y_pr
print('Коэффициент детерминации:',    r2_score(Y_test, Y_predict))
```

```
Средняя абсолютная ошибка: 0.4535969247666121
Средняя квадратичная ошибка: 0.6658758923668316
Median absolute error: 0.20000000000000284
Коэффициент детерминации: 0.9859711967787662
```

In [133…

```
plt.scatter(X_test.Potential, Y_test,    marker = 'o', label = 'Тестовая
plt.scatter(X_test.Potential, Y_predict, marker = '.', label = 'Предсказ
plt.legend(loc = 'lower right')
plt.xlabel('INSTRUCTION_EXPENDITURE')
plt.ylabel('INSTRUCTION_EXPENDITURE')
plt.show()
```



In [ ]: